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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Chihiro Kawai

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EXAMINER

ARENA, ANDREW OWENS

ART UNIT

PAPER NUMBER

2811

MAIL DATE

DELIVERY MODE

09/26/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/500,975	Applicant(s) KAWAI ET AL.	
	Examiner Andrew O. Arena	Art Unit 2811	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 May 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 13-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 29-37 and 39-61 is/are allowed.
- 6) ☒ Claim(s) 1-10, 13-28 and 38 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.


Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.


LYNNE GURLEY
SUPERVISORY PATENT EXAMINER
AV 2811, TC 2860

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed (on 07/06/2007) in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 05/30/2007 has been entered.

Claim Objections

Claim 1 is objected to because the wording of the preamble is somewhat confusing; "a filter for..., the filter composed of a porous semiconductor, comprising" reads as if it is the porous semiconductor that comprises the following limitations. It seems impossible, or at least confusing, that the porous semiconductor comprises a porous substrate; for one, the substrate is disclosed as ceramic or metal and not semiconductor, second, a semiconductor, per se, technically cannot comprise any non-semiconductor component, whereas a filter can. All confusion could be eliminated without altering the scope by changing the recitation to "a filter composed of a porous semiconductor for..., said filter comprising".

It seems all claims numbered greater than 15 suffer from the lack of clarity highlighted above for claim 1. A semiconductor, per se, technically cannot comprise

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any non-semiconductor component, whereas a semiconductor device can. All confusion could be eliminated without altering scope by changing the preambles to either "A porous semiconductor device..." or "A method for manufacturing a porous semiconductor device...", as appropriate.

Claim 1 is objected to as being unclear since "a porous semiconductor layer" is recited twice (lines 4 & 7) and it is unclear if applicant intends to require two separate layers. It seems the second recitation should be "said porous semiconductor layer".

Claim 20 is objected to because the recitation "end side" is confusing; an end is usually not considered a side, an object such as a column is generally considered to have two ends connected by the sides. The term "side" should be struck from the claim.

Claim 25 is objected to because it is unclear to what feature the limitation "having a diameter of..." applies; the claim can be read such that said limitation applies to the deposited particles or to the continuous pores of the semiconductor layer. All confusion could be eliminated without altering the scope by reciting said limitation immediately after the feature to which it applies.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 21 and 39 are rejected under 35 U.S.C. 112, ¶2, as being indefinite for failing to particularly point out and distinctly claim the inventive subject matter.

Claim 21 recites "porous film is disposed...at the distal ends and on an opposite surface", the metes and bounds of which cannot be ascertained, the recitation is confusing and contradictory, there are no columns on the opposite surface from the surface where the columns are formed, also, one film cannot be in two places at once.

Claim 39 recites: "a porous insulating layer" twice in succession without making it clear if they are two separate layers or where they are in relation to one another or the other layers; and "another electrode is formed on a top surface", which is so broad as to render the scope thereof unclear, there are many surfaces in the device, any of which can be considered as "a top surface".

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 7, 8, 16, 17, 20, 24-26, 28, and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Parker (US 4,801,380).

Re claim 1, Parker discloses a filter (col 1 ln 66-68) composed of a porous semiconductor, comprising (e.g., Figs 3-4):

a porous substrate (12) having continuous pores (16); and

a porous semiconductor layer (10) having continuous pores (14),

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wherein the porous substrate is a porous ceramic or a metal (col 2 ln 6-15) having continuous pores (16), and

[said] porous semiconductor layer is provided in on a surface of the substrate.

The preamble statement “for filtering, sterilizing, and decomposing organic matter” recites the purpose or intended use but does not impose distinct limitations beyond what is recited in the body of the claim. See MPEP § 2111.02(II).

The functional language “having a light emitting function that works by electroluminescence, cathode luminescence, or photoluminescence” does not structurally limit the apparatus claim but merely describes what a device does. See MPEP § 2114. Nevertheless, this property is present in the device of Parker, being an inherent property of the disclosed material (col 4 ln 13). See MPEP § 2112.

Re claims 2-4 , Parker discloses the porous semiconductor.

The functional language “emits ultraviolet light” does not structurally limit the apparatus claim but merely describes what a device does. See MPEP § 2114.

Re claim 7, Parker discloses an average pore size of the porous substrate and/or the porous semiconductor layer is from 0.0003 to 10 μm (col 1 ln 60).

Re claim 8, Parker discloses an insulating layer is formed on a front or back surface of the semiconductor layer (oxide in pore, col 3 ln 30; resin, col 2 ln 16).

Re claim 15, Parker discloses an average pore size of the porous substrate is from 0.01 to 1000 μm (col 1 ln 60, col 3 ln 46-48).

Re claim 16, Parker discloses a porous semiconductor [device] (col 1 ln 66-68), comprising (e.g., Figs 3-4):

a porous substrate (12) having continuous pores (16); and
a porous semiconductor layer (10) having continuous pores (14),
wherein the porous semiconductor layer is composed of a plurality of columns of semiconductor material which are separated (in at least one direction, MPEP § 2111) from each other and erected on a surface of the porous substrate (col 3 ln 45-50).

The preamble statement “for filtering, sterilizing, and decomposing organic matter” recites the purpose or intended use but does not impose distinct limitations beyond what is recited in the body of the claim. See MPEP § 2111.02(II).

The functional language “having a light emitting function that works by electroluminescence, cathode luminescence, or photoluminescence” does not structurally limit the apparatus claim but merely describes what the device does. See MPEP § 2114. Nevertheless, this property is present in the device of Parker, being an inherent property of the disclosed material (col 4 ln 13). See MPEP § 2112.

Re claim 17, Parker discloses the pores (16) in the porous substrate (12) are through-holes perpendicular to a substrate plane (Fig 4).

Re claim 20, Parker discloses the columns comprising a base component and a pointed component (pointed in some direction, MPEP § 2111) located on the distal end [side] of this base component.

Re claim 24, Parker discloses a filter that makes use of the porous semiconductor [device] (col 1 ln 66-68).

Re claim 25, insofar as this claim can be understood, Parker discloses a porous semiconductor [device] (col 1 ln 66-68), comprising (e.g., Figs 3-4):

a porous substrate (12) having continuous pores (16); and
a porous semiconductor layer (10) having continuous pores (14).

The preamble statement “for filtering, sterilizing, and decomposing organic matter” recites the purpose or intended use but does not impose distinct limitations beyond what is recited in the body of the claim. See MPEP § 2111.02(II).

The functional language “having a light emitting function that works by electroluminescence, cathode luminescence, or photoluminescence” does not structurally limit the apparatus claim but merely describes what the device does. See MPEP § 2114. Nevertheless, this property is present in the device of Parker, being an inherent property of the disclosed material (col 4 ln 13). See MPEP § 2112.

The product-by-process limitation “wherein the porous semiconductor layer is formed by depositing semiconductor particles having a light emitting function on a surface of the porous substrate and having a diameter of 0.01 to 5 μm ” does not structurally distinguish from the product of the prior art. See MPEP § 2113.

Re claim 26, Parker discloses an electrode (conductive substrate can be considered an electrode, col 3 ln 51-52).

The recitation “for injecting current” is a statement of intended use but does not structurally limit the apparatus claim. See MPEP § 2114.

Re claim 28, Parker discloses a surface of the semiconductor is coated with an insulating layer (oxide in pore, col 3 ln 30).

Re claim 38, Parker discloses a filter composed of the porous semiconductor [device] (col 1 ln 66-68).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6, 13-15, 18, 21 are rejected under 35 U.S.C. 103(a) as being obvious in view of Parker.

Re claims 6 & 13, Parker differs from the claimed invention only in not expressly disclosing a porosity of the semiconductor or the substrate.

One of ordinary skill the filter art must understand that clogging and filter effectiveness are result of varying porosity. See MPEP § 2141.03 citing Hiyamizu.

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that a porosity of the semiconductor layer and a porosity of the substrate is at least 30%; at least to achieve acceptable filtration.

Re claim 14, Parker discloses the thickness is a result of varying process conditions (col 4 ln 1-2) and does not particularly limit said thickness (col 4 ln 23-29).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that a thickness of the porous semiconductor layer disposed on the surface of the porous substrate is from 1 to 1000 μm ; as a design choice.

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Re claims 15 & 18, Parker discloses pore sizes in a range of 0.02 to 0.002 μm as possible (col 1 ln 58-61), even up to 1 μm (col 1 ln 33-35) and does not particularly limit said pore size (col 4 ln 23-29).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that a thickness of the porous semiconductor layer disposed on the surface of the porous substrate is from 0.01 to 1000 μm ; as a design choice.

Re claim 21, insofar as this claim can be understood, Parker differs only in not reciting an additional porous film.

Mere duplication of parts without a new and unexpected result bears no patentable significance. See MPEP § 2144.04(VI)(B).

The recitation "as an electrode" is a statement of intended operation but does not impart additional structural limitations. See MPEP § 2114.

Claims 5, 19, 22 and 27 are rejected under 35 U.S.C. 103(a) as being obvious over Parker as applied above, further in view of Shor (US 5,298,767).

Re claims 5, 19, 22 & 27, Parker differs from the claimed invention only in not disclosing the semiconductor layer having a pn junction structure.

Shor teaches a filter composed of a porous semiconductor with advantageous material properties (col 2 ln 40-44 & 59-61) that emits UV (col 1 ln 44-48, col 3 ln 23) and has a pn junction structure (col 4 ln 62-63; Fig 6, col 6 ln 29-33).

It is well known that UV light kills bacteria and therefore is useful in many filtration applications, e.g., as in Parker and Shor (see cited references not relied upon).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made to modify Parker in view of Shor such that the semiconductor layer has a pn junction structure; at least to allow UV emission.

Further re claim 22, Parker discloses an electroconductive porous film is disposed at the distal ends of the columns (that portion of the porous semiconductor) and the porous substrate is composed of an electroconductive material (col 3 ln 51-52). The recitations "as one electrode" and "constitutes another electrode" are statements of intended use but do not structurally limit the claim. See MPEP § 2114. Besides, such a use would be obvious, if not inherent, because emission cannot be achieved without electrodes.

Claims 9, 10, and 23 are rejected under 35 U.S.C. 103(a) as being obvious over Parker as applied above, further in view of Shor, Robertson (US 4,966,759) and Ogata (US 6,238,631).

Re claims 9, 10 & 23, Parker differs from the claimed invention only in not disclosing a material having a photocatalytic function.

Shor teaches that porous silicon emits light (col 2 ln 12-14) and also teaches a filter composed of a porous semiconductor with advantageous material properties (col 2 ln 40-44 & 59-61) that emits UV (col 1 ln 44-48, col 3 ln 23).

It is well known that UV light kills bacteria and therefore is useful in many filtration applications, e.g., as in Parker and Shor (see cited references not relied upon).

Roberson and Ogata both teach filtration using a photocatalytic material that is activated by irradiation with light (Roberson, col 6 ln 13-43; Ogata, col 6 ln 40-51).

It would have been obvious to a person having ordinary skill in the art at the time the invention was made that a photocatalytic function be incorporated into the insulating layer; at least to kill bacteria.

Allowable Subject Matter

The indicated allowability of claims 9, 10, 13-15 and 23 is withdrawn in view of the newly discovered references to Parker, Roberson, and Ogata.

Claims 29-37 and 39-61 are allowed.

Reasons for allowance are already of record.

Response to Arguments

Applicant's arguments filed 05/30/2007 have been considered but are moot in view of the new grounds of rejection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Kurtz teaches that porous Si has a light emitting function (col 1 ln 19-22).

Canham teaches advantages of increased porosity (col 1ln 10-31, col 2 ln 22).

Wilson, Engelhard, and Dempo teach filtration with UV bacteria killing.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew O. Arena whose telephone number is 571-272-5976. The examiner can normally be reached on M-F 8:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Lynne A. Gurley can be reached on 571- 272-1670. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



Andrew O. Arena
17 September 2007



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